STATE IN THE MINISTRY OF PARLIAMENTARY AFFAIRS (SHRI P. R. KUMARAMANGALAM): (a) and (b) India Meteorological Department uses a Power Regression Model to forecast the total quantum of monsoon rainfall over the entire Southwest Monsoon season (June to September). The Model uses observational data of a set of 16 regional and globol land-ocean atmospheric parameters. These parameters are physically related to the Indian summer monsoon rainfall and some observational data upto the end of May are required for making the forecast.

Major Space Programmes

1522. SHRI MURLIDHAR CHANDRAKANT BHANDARE: Will the PRIME MINISTER be pleased to state:

(a) the major space programmes undertaken since 1980;

(b) the details of the achievements made under these programmes;

(c) the extent to which these have been useful in various activities; and

(d) the details of the programmes to be undertaken during the Eighth five year Plan?

THE MINISTER OF STATE IN THE PRIME MINISTER'S OFFICE (SHRI BHUVNESH CHATURVEDI): (a) to (c) The main thrust of the Space Programme undertaken since 1980 has been towards establishing national system using space technology for telecommunications, broadcasting meteorology and remote sensing for the effective survey and optimal management of national natural resources. The indigenous development of various application setellites, their payloads and the capability to lunch these satellites are integral to this objective.

In order to achieve the above objectives, major new projects and missions such as Augmented Satellite Launch Vehicle (ASLV), Stretched Rohini Satellite Series (SROSS), Indian Remote Sensing Satellite (IRS), Polar Satellite Launch Vehicle (PSLV), INSAT-1C and ID and INSAT-II Test Spacecrafts (A and B), INSAT-2CDE, IRS 1C/1D and Geo-synchronous Launch Vehicle (GSLV) Projects were sanctioned during this period.

The following major projects were completed during this period:—

(i) Communication Satellite APPLE was launched in June 1981 utilising the free launch opportunity provided by European Space Agency. APPLE was used for 27 months for conducting advanced satellite communication experiments, TV/Radio networking, Digital communication experiments and tele-conferencing, telemedicine and facsimile transmission for newspaper printing.

(ii) Bhaskara-II satellite carrying remote sensors in the visible and microwave region of the electro—magnetic spectrum paved the way for an end-to-end experimental satelite romote sensing programme.

(iii) The Second experimental flight of SLV-3 conducted in July 1980 placed successfully a 35 kg Rohini Satellite in near earth elliptical orbit. Two more flights of SLV-3 were realised in May 1981 and April 1983, marking the fruition of vital element of technology development, SLV-3 being a crucial precursor to the ASLV and PSLV prijects.

(iv) Under INSAT System, INSAT-1B, INSAT-1C and INSAT-1D were launched successfully in August 1983, July 1988 and June 1990 respectively, providing excellent operational services for satellite based telecommunications, broadcasting and meteorology services in the country.

(v) IRS-1A was launched successfully in March, 1988 followed by successful launch of IRS-1B in August 1991. These two spacecrafts are providing valuable data on the

natural resources of the country, which are used for operational remote sensing application projects/ missions, as part of national natural resources management system.

(vi) In May 1992, ASLV-D3 successfully injected SROSS-C satellite into orbit, demonstrating several advanced technologies such as closed loop guidance, strap on staging and bulbous metallic heat shield etc., and capability of the country to lunch 150 kg class of satellites in the low earth orbits.

The INSAT System, established in 1983, which revolutionised the communication facilities in the country, was the first step towards implementing operational Space Systems for identified national requirements. The multi-purpose INSAT Systems cater to domestic long-distance communications, meteorological observations and data relay, nation-wide direct satellite TV and radio broadcasting, enabling remote area communication and operationalisation of disaster warning system in cyclone-prone areas. The development of indigenous second generation INSAT-Spacecraft (INSAT-2) was initiated in 1985 for replacing the first generation INSAT-1 Spacecraft built abroad. INSAT-2 will cover the expanded telecommunications, TV and radio requirements and the meteorology service demands of the 1990s and also new applications like Search and Rescue. Another major initiative taken up in the area of satellite communication during the Decade 1980-90 was the Satellite-based Search and Rescue Programme.

A National Natural Resources Management System (NNRMS) has been established in the country, combining optimally the advantages of the satellite remote sensing and conventional methods. One of the major objectives of NNRMS is to evolve a National Resources Information System (NRIS) for the country for all resources themes, nation-wide remote sensing application, mapping for agro-climatic zonal planning, drought monitoring and assessment, crop acreage and yield estimation, fisheries, potential forecast, water resources survey, wasteland mapping, froest cover monitoring and such other allied areas. The IRS series of spacecraft form the most vital component of NNRMS.

The Indian Middle Atmosphere Programme, an important multi-agency scientific programme, was concluded in 1989. Establishment of the MST Radar Facility is another national effort coordinated by the Department of Space, for the study of atmosphere dynamical processes to investigate winds, waves and turbulance with high resolution ground based observations using MST Radar to cover the three regions of the middle atmosphere. Infrared Telescope Facility established at Gurushikar, is expected to be fully operational soon. A number of ground based ballon and rocket borne campaign experiments were conducted in the space science area.

Under the Sponsored Research Programme (RESPOND), several projects were funded and monitored in Universities/IITs/National Laboratories. Space Technology Cells have been established in the Indian Institute of Science, Bangalore, and IIT-Madras and IIT-Bombay. Interaction with other academic institutions of excellence has also been forged. As a part of our commitment to assist other developing countries, Sharing of Experience (SHARES) Programme has been introduced by which these countries may avail of certain facilities like training and consultation.

Strengthening of the linkages with the Indian industries has been one of the major achievements of the Department. Dedicated facilities have been established in HAL and BEL for Space Programme technologies have been transferred to several Indian industries.

(d) The thrust areas during the Eighth Plan Period are the following:

(i) Efficient management of INSAT System planning and operations to provide a multitude of national services.

(ii) INSAT-2 space segment establishment and operationalisation.

(iii) Augment the operational Satellite Aided Search and Rescue (SAS&R) rpogramme with geostationary satellite component.

(iv) Establishing an initial Mobile Satellite communications system including experiments with low earth orbiting satellites for rural|moble communications.

(v) Development of new and advanced satellite based communication applications in the areas of information dissemination, interactive distant education etc., including a ORAMSAT Network dedicated for aiding rural development and education, domonstration and evaluation of the same.

(vi) Active cooperation and assistance to industry to enable it to meet the satellite communication equipment requirement, both domestic and export.

(vii) Studies and technology development programmes leading to the difinition and initiations of programmes identified for realisation in the ninth plan such as direct broadcast satellite system and INSAT-3.

The following launches are planned during the Eighth Plan Period:

(i) INSAT-2A and B Test Spacecrafts, designed and planned in the country, replacing the first generation INSAT-1 Spacecraft built abroad, were launched successfully in July 1992 and July 1993 respectively from Kourou, French Guiana, proving the capability of the country to develop multi purpose communication satellites.

(ii) The Polar Satellite Launch Vehicle (PSLV), designed to place 1000 kg class remote sensing satellite into 900km polar sun-synchronous orbit is ready for launch during second half of 1993.

(iii) The second generation IRS-IC and 1D Spacecraft to cater to various user requirements such as continuity of data, improved specification with respect of resolutions, spectral bands, on board data recording, stereo viewing and board more frequent revisits, are scheduled for launch during 1993-94 and 1996-97 respectively.

(iv) Indian Remote Sensing P2 Project, to provide a payload for the second PSLV Developmental Flight viz., PSLV-D2 in order to demonstrate the Palar Satellite Launch Vehicle (PSLV) capability to place IRS class of remote sensing satellites into Polar Sunsynchronous orbit is scheduled to be launched during the Eighth Plan period.

(v) SROSS-D3 and D4 satellites onboard ASLV-D3/D4 are scheduled to be launched during the Eighth Plan period.

(vi) Geo-synchronous Launch Vehicle (GSLV), capable of placing 2,500kg INSAT-2 class satellites into geosynchronous transfer orbit is also scheduled to be launched towards the end of the Plan period.

In order to promote spin-offs from space technology to other sectors and also to exploit the growing international market for space services and products, M|s. Antrix Corporation Ltd., has been set up in 1992 as a wholly owned Government Company under the administrative control of the Department of Space.

CLARIFICATION ON THE STATEMENT BY MINISTER

Correcting answers to Starred Question 47 answered on 28-7-1993 regarding untarined drivers in Redline buses.

THE MINISTER OF STATE OF THE MINISTRY OF SURFACE TRANSPORT (SHRI JAGDISH TYTLER): The reply to part (e) and (f) to Rajya